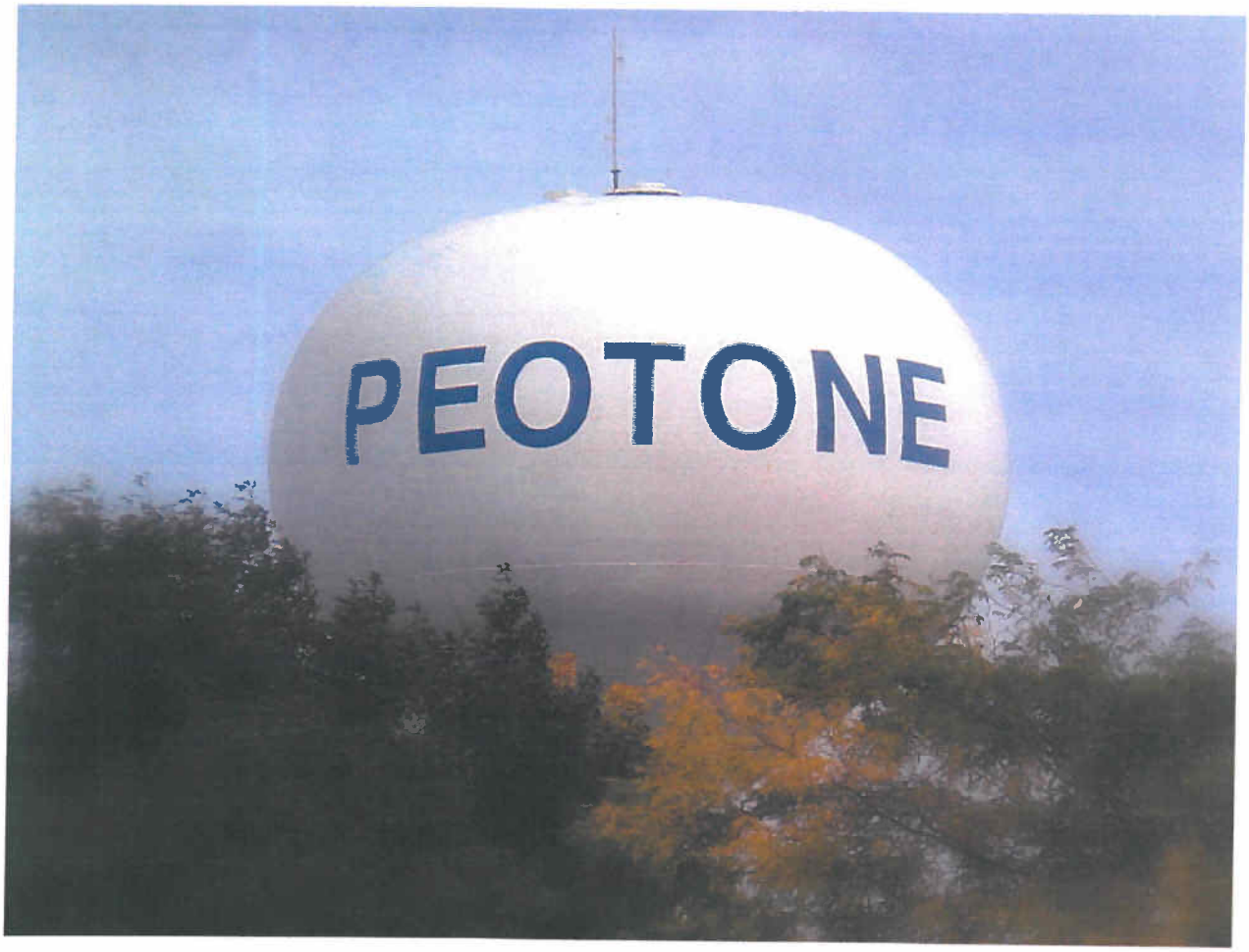
WATER DISTRIBUTION SYSTEM ANALYSIS
VILLAGE OF PEOTONE
07-367



OCTOBER 2008

PREPARED BY:

Robinson ENGINEERING

EXECUTIVE SUMMARY

Robinson Engineering, LTD. under direction from the Village of Peotone has completed a Water Distribution System Analysis, which consisted of a computerized water model detailing of all water mains, wells, pumps, and storage and this written report. This report provides the Village with a summary of the current system and proposed improvements. The examination of the existing system shows the Village to be well interconnected and able to meet average demands adequately. The Village continues to experience rapid population growth with a 23.7% increase since the 2000 census. This report contains recommendations for improvements to the water system to keep the system updated and functioning properly to meet current needs and expected population growth.

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VILLAGE OF PEOTONE

WATER DISTRIBUTION SYSTEM ANALYSIS

I. INTRODUCTION

The Village of Peotone authorized Robinson Engineering, Ltd. to create a computerized model of the entire Village's water distribution system. This model will serve as a major tool in planning the Village's water distribution system expansions and determining the system's deficiencies and recommending solutions. This report analyzes the existing distribution system by utilizing a computerized hydraulic model that has been calibrated to simulate pressures and flows within the existing distribution system. System improvements, specifically regarding future development and the location of future water storage, were evaluated and examined to determine if they would prevent low-pressure and low fire flow areas throughout the Village.

II. PEOTONE WATER MODEL DEVELOPMENT

System Definition

The Village of Peotone has a population of approximately 4,200 residents and is located approximately 43 miles south of the Chicago. The following figure shows the location of the Village in proximity to surrounding communities.

Figure 1 Location Map

The Village receives water from three wells within the Peotone Village limits, which is treated with and stored in two elevated tanks providing 400,000 gallons of storage. The system allows Peotone to operate as a single zone pressure system. The Village currently has approximately 27 miles of water main varying in size from 4-inch to 16-inch pipe providing service to residential, commercial, and industrial customers. The Village does not currently provide water to any surrounding communities. The water main sizes are summarized in the table below.

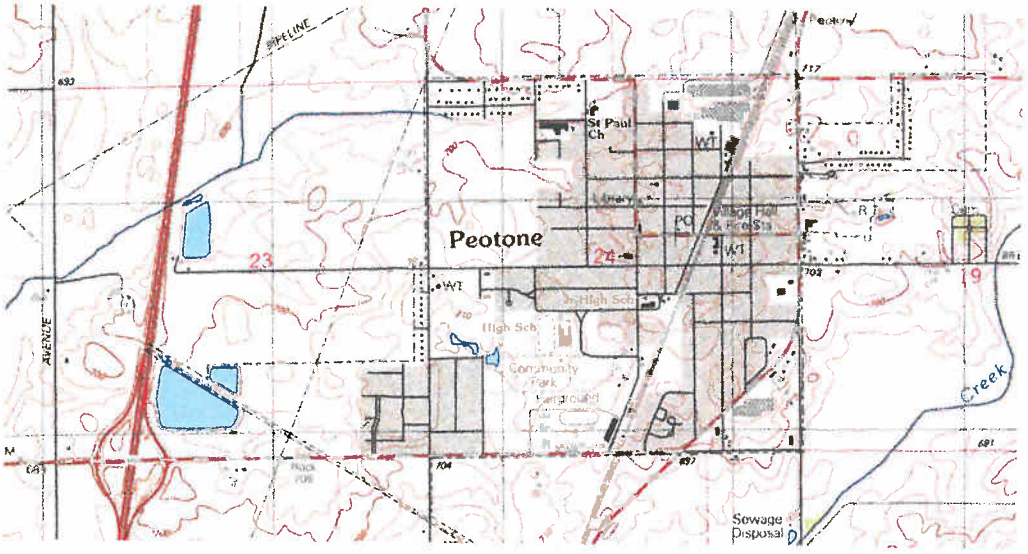
Table 1 – Water Main Diameter & Length	
Main Diameter	**Approximate Total Length**
4 inch	18,300 feet
6 inch	62,800 feet
8 inch	45,800 feet
10 inch	8,700 feet
12 inch	7,000 feet
16 inch	1,200 feet
Total	143,800 feet

Village Topography

The Village of Peotone has elevation relief of 30 ft. Figure 2 shows the United States Geological Survey (USGS) topographic map for the Peotone area.

It should be noted that a detailed topographic survey of the Village was not completed for this model. General elevation data from existing county contour maps were used; therefore, some elevations used in the model may differ from actual elevations. This will also cause a difference in observed pressures. An elevation difference of approximately five feet will cause a pressure difference of approximately 2 psi.

Figure 2 USGS Topographic Map



Data Collection

Three types of data collection were needed to complete the study:

1. A computerized hydraulic model of the existing water distribution system;
2. Hydraulic field data to calibrate the hydraulic model for validity; and
3. Physical and historical information concerning the existing distribution system.

A computerized hydraulic model was developed using the WaterCAD™ software package, developed by Haestad Methods. Figure 3 shows the water model that was developed relative to Peotone water atlas and street map. The model required the following information to develop a representation of the Village's distribution system:

- Water main lengths
- Location of water mains
- Existing elevated tank data
- Miscellaneous information regarding unusual system connections.
- Water main diameters
- Pump station data
- Consumer demands

The location, length, and diameter of water mains were determined from Peotone's electronic water main atlas. Peotone public works employees then reviewed the information.

VILLAGE *of* PEOTONE, ILLINOIS

MASTER WATER STUDY EXISTING WATER DISTRIBUTION SYSTEM

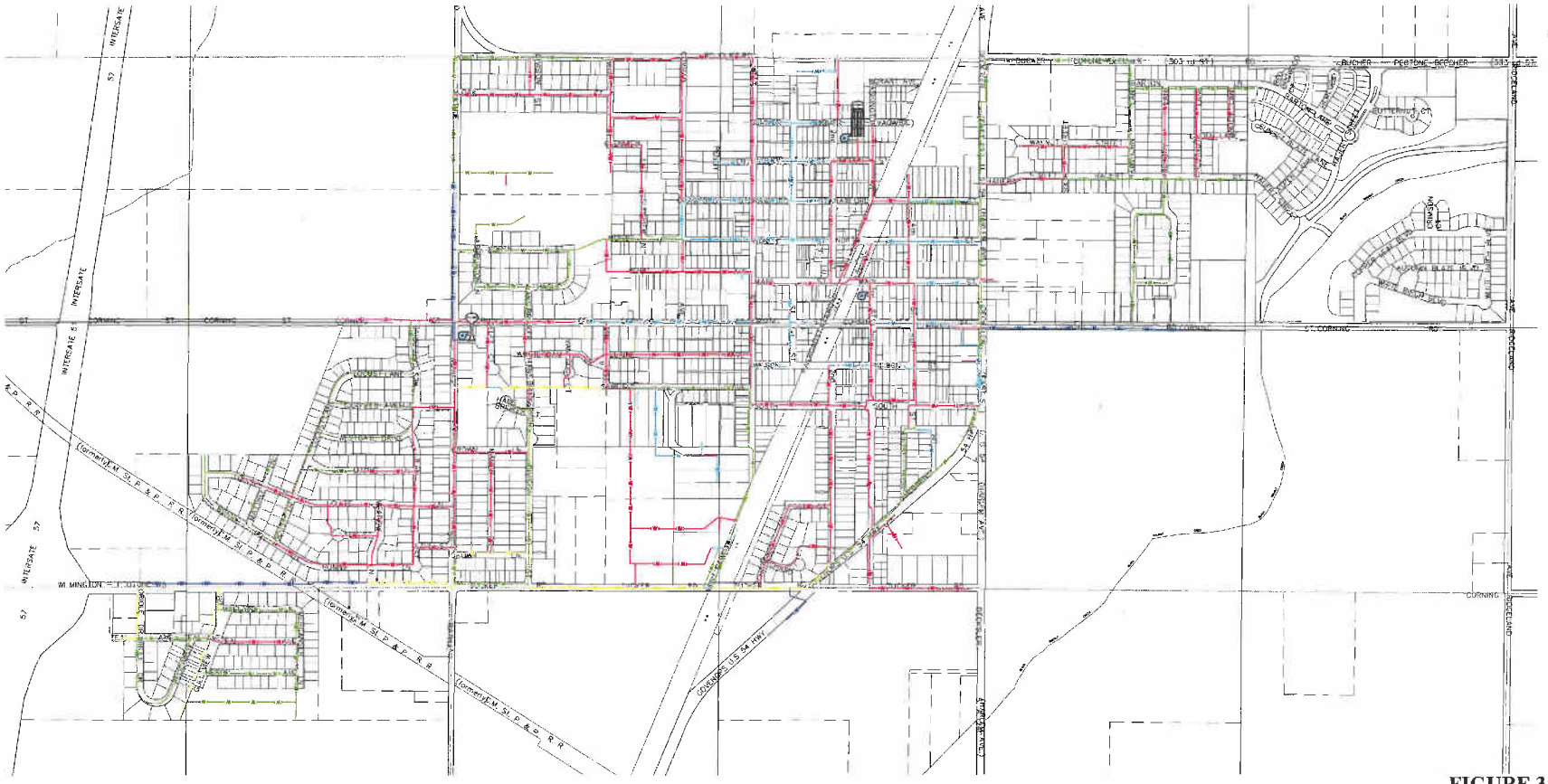


FIGURE 3

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Water usage, tracked by the Village, was used to determine consumer demands needed for the model. Records indicate that over the past year average monthly water usage was 355,000 gallons and the peak monthly pumpage recorded in August was 819,000 gallons. This is equivalent to 569 gallons per minute (gpm). Table 2 provides a monthly water production summary for 2006. There are currently 1,352 customers using Peotone water. Approximately 91 (7%) are designated as commercial, public entities, or industrial users. For model development, recorded average daily demands for the top ten users were supplied by the Village and applied to nodes located nearest to the user and the remainder was applied to residential nodes. Therefore, the peak average daily demand of 246 gpm was distributed throughout the nodes by applying a demand of 0.82 gpm to each residential node.

The pump station, elevated tanks, and miscellaneous information regarding system connections were determined from original construction plans, visual observation of the facility, available manufacturer's specification sheets, and knowledge of plant personnel.

Table 2

2006 Monthly Water Production Summary (Gal.)			
	Average Flow	Peak Flow	Total Pumpage
January	298,000	367,000	9,224,000
February	303,000	356,000	8,488,000
March	307,000	426,000	9,512,000
April	381,000	590,000	11,421,000
May	349,000	516,000	10,808,000
June	468,000	704,000	14,030,000
July	427,000	596,000	13,233,000
August	410,000	819,000	12,697,000
September	318,000	484,000	9,541,000
October	395,000	705,000	12,258,000
November	295,000	463,000	8,837,000
December	302,000	446,000	9,376,000

III. PEOTONE MODEL CALIBRATION

Fire Hydrant Testing

After the model was physically accurate, we performed fire flow tests to hydraulically calibrate the model. Fire flow tests were performed in strategically selected locations to obtain actual field data. Results of the fire flow tests are shown in the table below.

Table 3 Fire Hydrant Test Results

Test Location	Port Size (inches)	Actual Hydrant Flow		Actual Hydrant Pressure	
		Pitot (psi)	Flow (gpm)	Static Pressure (psi)	Residual Pressure (psi)
W. Summer & West St.	2.5	45	865	48	48
Second St. & W. Main	2.5	15	610	45	45
East Corning & Third St.	2.5	7.5	425	44	44
Hauert St. & Hawthorn Lane	2.5	27.5	825	45	45
1st Hydrant South of E. Corning on Rte 50	2.5	45	1030	50	50
South Third St. & Rte 50	2.5	27.5	825	47	47
Will County Fairgrounds	2.5	30	865	43	43
1st Hydrant west of West St. on Garfield Ave.	2.5	25	785	49	49
Teal Ave. & Gull View Dr.	2.5	27.5	825	49	49
Rathje Road & Joliet*	2.5	40	1000	51	51